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# C5 Engineering, Inc.

## Water and Wastewater Engineering

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September 6, 1999

Mr. Roy Hunt  
City Manager  
465 1<sup>st</sup> Avenue  
P.O. Box 70  
Holbrook, Arizona 86025

Subject: Keams Canyon / I-40 Interchange  
Utility Feasibility Study

Dear Roy:

It is with great pleasure that I submit this final version of the Keams Canyon / I-40 Interchange Utility Feasibility Study. For your ease of use I have furnished an Executive Summary just before the following report sections:

- ▶ Section 1 - Scope of Work
- ▶ Section 2 - Existing Businesses and Existing Infrastructure
- ▶ Section 3 - Current and Future Water Flow Projections
- ▶ Section 4 - Conceptual Future Water Facilities
- ▶ Section 5 - Current and Future Wastewater Flow Projections
- ▶ Section 6 - Conceptual Future Wastewater Facilities
- ▶ Section 7 - Conceptual Construction Cost Estimates

After you have read this final version, should you wish, I would be happy to present a summarized version of this report to the City Council.

As always, thank you very much for allowing C5 Engineering to be such an integral part of the City's planning process and engineering efforts.

Sincerely,

James H. Christian, P.E.  
Executive Vice President

xc: Mr. Ron Eisele

C5 Engineering, Inc.

Water and Wastewater Engineering

# Table of Contents

**1**

**Scope of Work**

**2**

**Existing Businesses and Existing Infrastructure**

**3**

**Current and Future Water Flow Projections**

**4**

**Conceptual Future Water Facilities**

**5**

**Current and Future Wastewater Flow Projections**

**6**

**Conceptual Future Wastewater Facilities**

**7**

**Conceptual Construction Cost Estimates**

**8**

**Appendices**



## Executive Summary

The Keams Canyon Interchange, approximately 4 miles east on Interstate 40 from the City of Holbrook (City) city limits, has very limited potable water and sewer service. This area would have a very strong potential for growth if additional water and sewer services were extended from the City.

Currently the Shipley-Phillips Truck Terminal is the single largest user of potable water in this area and the single largest producer of sewage. Shipley-Phillips gets their water from the Sun Valley Water District, and, in turn, Shipley-Phillips is Sun Valley's largest water customer. Should Shipley-Phillips acquire their water from another source other than Sun Valley, Sun Valley would most likely desire to have Sun Valley's water supplied from that same source (i.e., the City of Holbrook in this case).

Shipley-Phillips uses two City sewer pumping stations to pump their sewage from their terminal to the City's sewer collection system via a 4-inch sewer forcemain. However, it is becoming a more common occurrence to have the sewage pumping station nearly over flow due to its' two limited wet well sizes.

Another user of water and producer of sewage is the International Petrified Forest (IPF). Currently IPF hauls their water to their facility and disposes of their sewage via a septic tank and leach field. Should the City extend services out to their facility, IPF would be very interested in using the City's services.

Beyond these two main uses, several other land and potential business owners were interviewed as to what they would build if water and sewerage were not an issue. Table 3-1 is a summary of those potential future businesses and services.

After evaluating these water needs found in Table 3-1, a phased approach was developed to estimated how much and when these water needs would come about. Table 3-6 below summarizes these phased water needs.

**Table 3-6, Summary of Phased Water Needs**

Flow Rate	Existing Flows	Phase 1 Flows (0 to 5 Years)	Phase 2 Flows (5 to 10 Years)	Phase 3 Flows (10 to 15 Years)
Gallons Per Day (GPD)	34,333	108,616	146,916	197,956
Gallons Per Minute (GPM)	72	210	267	367

After establishing the above water needs, several computer models were developed to determine the water pipeline sizes, requirements for a booster pumping station, and other elements required to have a functional water system extending from the City's current water system out to the Keams Canyon Interchange. It was determined that a booster pumping station is required at the base of the existing elevated water storage tank. The pipeline will need to be 8-inches in diameter from the booster pumping station to the Keams Canyon interchange.



**Table 3-1, Summary of Total Existing and Projected Water Needs**

Area No. on Map	Information Source	Location	Main Description	Estimated Unit Flow		Estimated Total Area Flow	
				GPD	GPM	GPD	GPM
1	City / Bill Jeffers	North Side of I-40 by Airport	(30) 1 Ac Commercial Lots	24,000	40.00	24,000	40.00
2	Bill Jeffers	North Side of I-40 by Airport	(10) 5 Ac Ranches	8,000	13.33	8,000	13.33
3	Marvin Hatch	North Side of I-40	(10) 5 Ac Ranches	8,000	11.11	8,000	11.11
4	Dale Phillips	Keams Canyon - North Side	Existing Truck Stop Existing Water Consumption Additional Water Needs Now	33,333 33,333	69.44 69.44	66,666	138.89
5	Gary Darling	Keams Canyon - North Side	Opposite of existing truck stop 100 Room Motel 100 Person Sit-down Restaurant C Store with Gas & Fast Food 50 Space RV Park for Passenger Cars Small Park w/ Restroom & Grass Area Big Rig RV Park 100 Spaces, Showers, Restrooms Laundry Facility	5,600 5,000 3,300 5,800 1,000 11,600 2,750	11.67 4.63 3.06 12.08 16.67 24.17 5.73	35,050	78.00
6	Gary Scaram (Hatch)	Keams Canyon - South Side	International Petrified Forest Existing Use Hydroponics Planting 140 Room Motel 125 Person Sit-down Restaurant Fast Food Restaurant	1,000 3,000 7,840 6,250 2,250	2.08 2.08 16.33 5.79 2.08	20,340	28.37
7	Gary Scaram (Hatch)	Exit 289 - South Side	(16) 5 Ac Ranches	12,800	17.78	12,800	17.78
8	Gary Scaram (Hatch)	Exit 289 - South Side	Truck Stop Gas Station Truck Wash 125 Person Sit-down Restaurant 50 Space RV Park	1,050 10,000 6,250 5,800	0.97 20.83 5.79 12.08	23,100	39.68
Total Flows				197,956	367.15	197,956	367.15



Minimal fire protection can be obtained out at the Keams Canyon interchange by installing the City's two existing 25,000 gallon water tanks coupled with installing one new electric 1000 gpm fire pump. This configuration will result in a fire flow of 1000 gpm for approximately one hour.

Analyzing the water flows developed above, it was determined that the following four options should be analyzed to transport potable water out to the Keams Canyon Interchange area:

#### **Water Option 1 - New 8-inch Water Pipeline without Fire Protection and without Bladder Tanks**

Construct a new booster pumping station and an 8-inch water pipeline to transport potable water from the City out to the Keams Canyon Interchange. The general pipeline alignment is as shown on Drawing 4-1 and Drawing 4-2, Future Water System.

#### **Water Option 2 - New 8-inch Water Pipeline without Fire Protection and with Bladder Tanks**

Construct a new booster pumping station and an 8-inch water pipeline to transport potable water from the City out to the Keams Canyon Interchange. Out at the Keams Canyon interchange install two buried 500 gallon bladder tanks to minimize pump on/off cycles during low flow situations. The general pipeline alignment is as shown on Drawing 4-1 and Drawing 4-2, Future Water System.

#### **Water Option 3 - New 8-inch Water Pipeline with Fire Protection and without Bladder Tanks**

Construct a new booster pumping station and an 8-inch water pipeline to transport potable water from the City out to the Keams Canyon Interchange. Out at the Keams Canyon interchange install the City's two existing 25,000 gallon above ground, steel, potable water tanks along with a new 1000 gpm fire pump. This arrangement will furnish a 1000 gpm fire flow for approximately one hour. The general pipeline alignment is as shown on Drawing 4-1 and Drawing 4-2, Future Water System.

#### **Water Option 4 - New 8-inch Water Pipeline with Fire Protection and with Bladder Tanks**

Construct a new booster pumping station and an 8-inch water pipeline to transport potable water from the City out to the Keams Canyon Interchange. Out at the Keams Canyon interchange install the City's two existing 25,000 gallon above ground, steel, potable water tanks along with a new 1000 gpm fire pump. This arrangement will furnish a 1000 gpm fire flow for approximately one hour. In addition, out at the Keams Canyon interchange install two buried 500 gallon bladder tanks to minimize pump on/off cycles during low flow situations. The general pipeline alignment is as shown on Drawing 4-1 and Drawing 4-2, Future Water System.

Wastewater flows were then evaluated based upon the potable water needs and flow rates. Specific areas that would contribute wastewater flows that could either flow into a new sewer interceptor, into a reuse water treatment plant, or into an upgraded sewer forcemain system include (please refer to Drawing 3-2 for area number locations):

- Area 3, North side of I-40 just west of the Keams Canyon Interchange



- Area 4, the existing truck stop at the Keams Canyon Interchange
- Area 5, the area due east of the existing truck stop at the Keams Canyon Interchange
- Area 6, the International Petrified Forest area

A summary of these flows are as shown in Table 5-1 below.

<b>Table 5 -1, Phased Wastewater Flows for Keams Canyon Interchange</b>				
Flow Rate	Existing Flows	Phase 1 Flows (0 to 5 Yrs)	Phase 2 Flows (5 to 10 Yrs)	Phase 3 Flows (10 to 15 Yrs)
Gallons Per Day (GPD)	30,000	71,000	88,300	117,100
Gallons Per Minute (GPM)	62	142	161	231

Analyzing the wastewater flows developed above, it was determined that the following six options should be analyzed to either process and reuse or transport the sewage produced at the Keams Canyon Interchange area:

**Wastewater Option 1, 2, and 3 - New Sewer Interceptor** (only services north side of freeway)

Construct a new 6-inch, 8-inch or 10-inch PVC sewer interceptor to transport the sewage from the Keams Canyon Interchange to the City's existing collection system. The general interceptor alignment is as shown on Drawing 6-1 and Drawing 6-2, Proposed New Sewer Interceptor.

**Wastewater Option 4 - New Water Reclamation Facility** (services both sides of freeway)

Construct a new 150,000 GPD water reclamation plant on the south side of I-40 for the purposes of treating and reusing the wastewater as a source of irrigation water. This concept would then require hauling the sludge generated at the plant to the Painted Mesa Water Reclamation Facility for final processing and disposal. The general water reclamation plant is as shown on Drawing 6-3, Proposed New Water Reclamation Facility.

**Wastewater Option 5 - Modify the Existing Sewer Pumping Stations and Forcemain System** (only services north side of freeway)

Upgrade the two existing sewer pumping stations by constructing new, larger wet wells at each station and adding one more pump at each station for a total of three pumps per station. The existing 4-inch forcemain would be used as-is. The general existing forcemain alignment and pumping stations are as shown on Drawing 6-4 and Drawing 6-5, Upgraded Sewer Forcemain System.



**Wastewater Option 6 - Modify the Existing Sewer Pumping Stations and Forcemain System and Add Service to the South Side of the Freeway (services both sides of freeway)**

This is the same as Option 5 above plus adding a new sewer lift station at the International Petrified Forest and a forcemain connecting that lift station to the Shipley-Phillips Lift Station #1.

The final section of this report outlines the conceptual construction costs for the proposed water and wastewater system options. The following table summarizes these costs.

<b>Table 7-1, Conceptual Construction Material and Engineering Cost Estimate Summary</b>		
<b>Option Number</b>	<b>Description</b>	<b>Total Conceptual Construction Material and Engineering Costs</b>
<b>Water Option 1</b>	New 8-inch Water Pipeline without Fire Protection and without Bladder Tanks	\$303,887
<b>Water Option 2</b>	New 8-inch Water Pipeline without Fire Protection and with Bladder Tanks	\$309,487
<b>Water Option 3</b>	New 8-inch Water Pipeline with Fire Protection and without Bladder Tanks	\$341,632
<b>Water Option 4</b>	New 8-inch Water Pipeline with Fire Protection and with Bladder Tanks	\$347,232
<b>Wastewater Option 1</b>	New 6-inch Sewer Interceptor	\$149,818
<b>Wastewater Option 2</b>	New 8-inch Sewer Interceptor	\$180,022
<b>Wastewater Option 3</b>	New 10-inch Sewer Interceptor	\$224,010
<b>Wastewater Option 4</b>	New Water Reclamation Facility	\$745,086
<b>Wastewater Option 5</b>	Modify the Existing Sewer Pumping Stations and Forcemain System	\$45,537
<b>Wastewater Option 6</b>	Modify the Existing Sewer Pumping Stations and Forcemain System and Add Service to the South Side of the Freeway (services both sides of freeway)	\$140,155



1



## Section 1 - Scope of Work

This utility feasibility study will be an extension of C5 Engineering's original City wide feasibility study developed in November, 1997. However this study will more closely examine the Shipley-Phillips Interchange (Interchange) and how water and wastewater services can be best delivered to that general area. Items that will be considered in the study will include:

1. Developing current, 5, 10, and 15 year flow projections for water and wastewater for the Interchange area. Consideration will also be given to that area along the water pipeline route (i.e., that area between the current City limits and the Interchange along the proposed water pipeline route). Issues to be taken into consideration will be how the current Interchange area businesses will expand and how future businesses may develop in this same area. City staff will be used to help project this potential growth.
2. Using the above flow information, determine the most cost effective approach to supply water to the Interchange area. Conceptual computer water modeling will be used to develop a pipeline size and pumping station (if required).
3. Using the above flow information, determine the most cost effective approach to dispose of the sewage generated at the Interchange area. Items to be considered will include:
  - a. Determine the maximum flow that the existing 4-inch forcemain can carry that extends from the Interchange area to the City's collection system.
  - b. Develop a conceptual design for upgrading the two existing sewer pumping stations and the existing sewer forcemain extending from the Interchange area to the City's collection system.
  - c. Develop a conceptual design for a new gravity sewer extending from the Interchange area to the City's collection system.
  - d. Develop a conceptual design to treat the sewage at the Interchange area and apply the reuse water to that area for irrigation / green belt areas and to transport the sludge to the Painted Mesa Water Reclamation Facility for final treatment.
4. Develop conceptual construction costs and construction schedules for the water and wastewater projects.
5. Summarize the above information in a brief letter report and provide two copies to the City.
6. As normal, as the study is developed C5 Engineering will closely coordinate with City staff to ensure that the City's needs and wants are fully incorporated into the feasibility study.
7. Under the direction of Mr. Roy Hunt, if desired, C5 Engineering will summarize and present the findings of the study to the City Council.

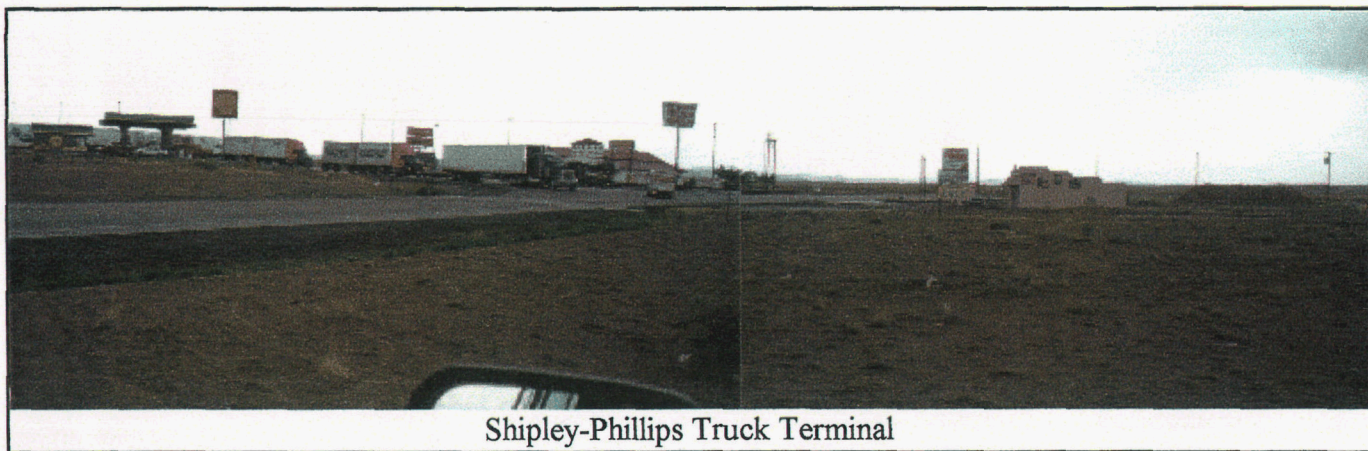
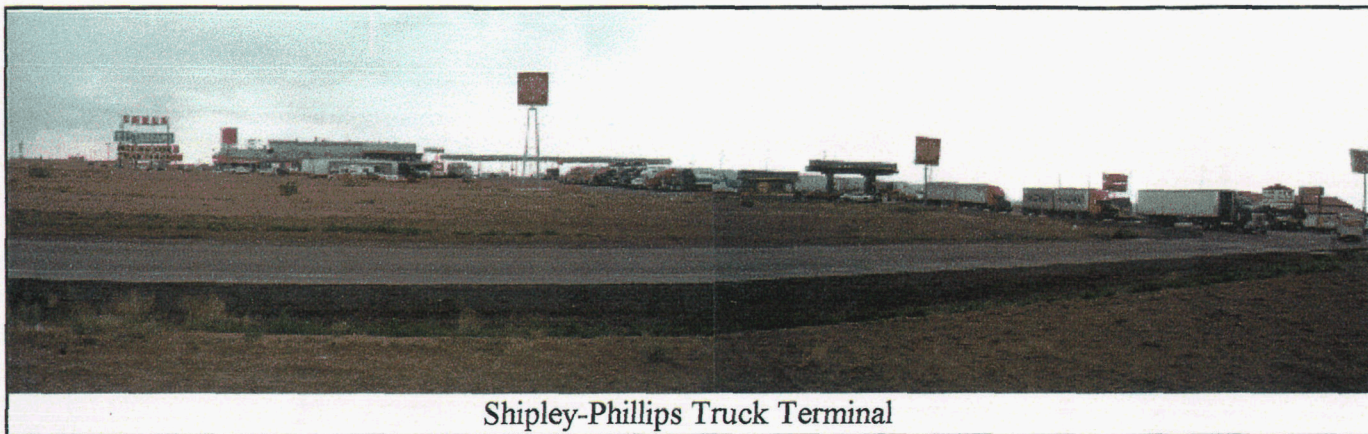


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## Section 2 - Existing Businesses and Existing Infrastructure

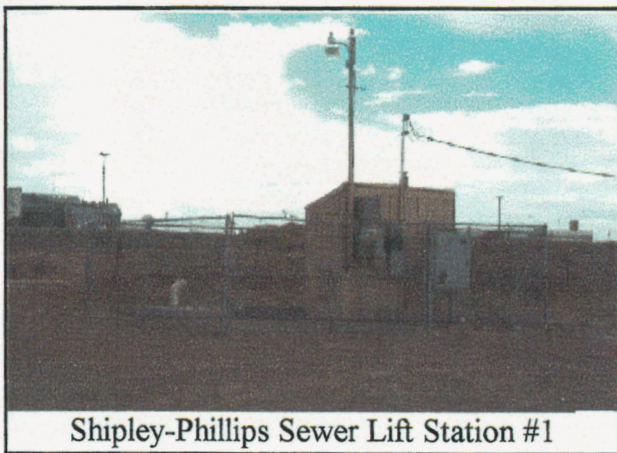
The following is a photo tour of the existing businesses and existing infrastructure that services the Keams Canyon Interchange area.



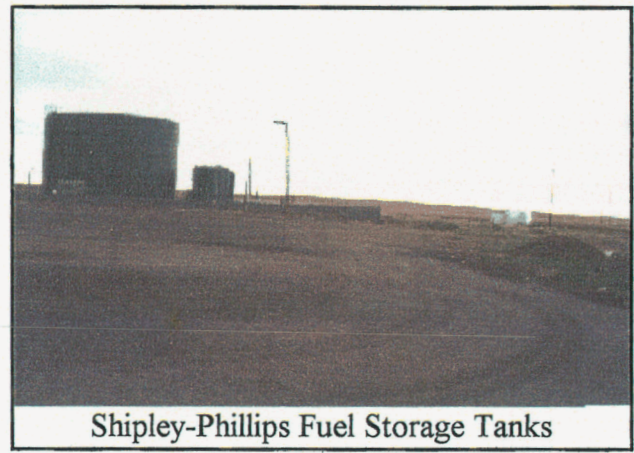




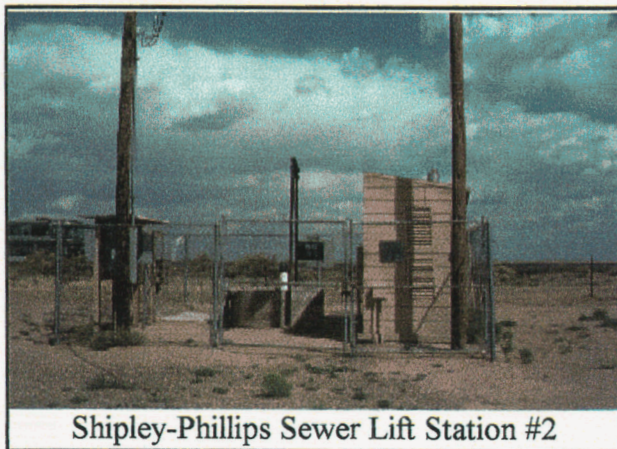
Keams Canyon Interchange Looking South-West



Shipley-Phillips Sewer Lift Station #1



Shipley-Phillips Fuel Storage Tanks

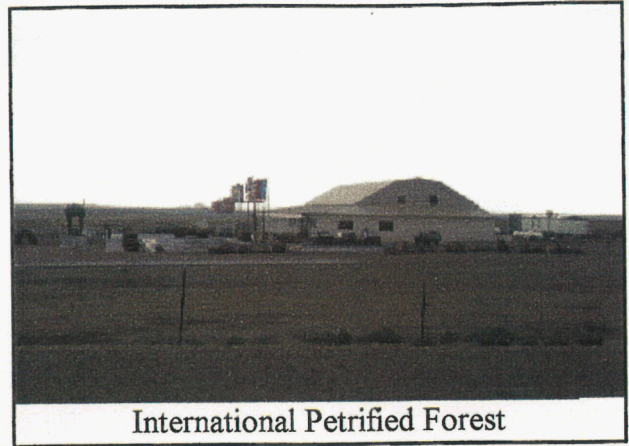


Shipley-Phillips Sewer Lift Station #2

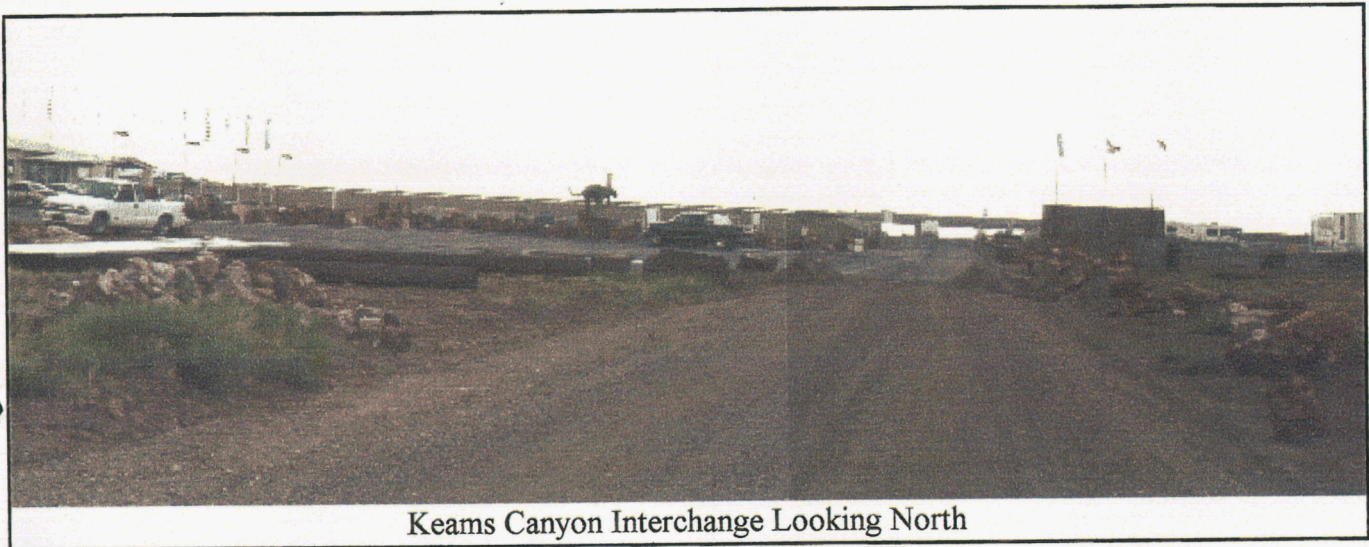




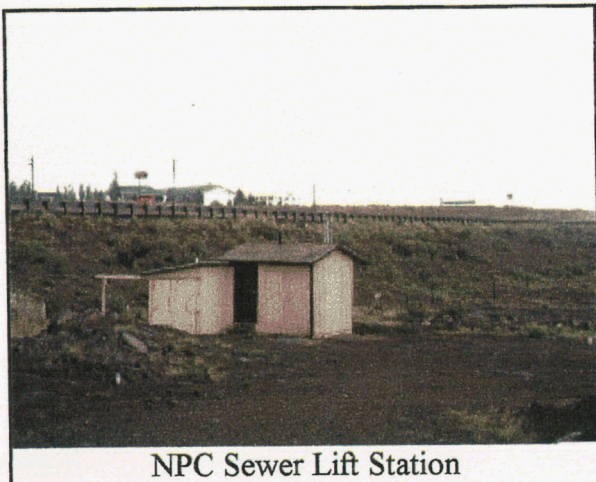
International Petrified Forest



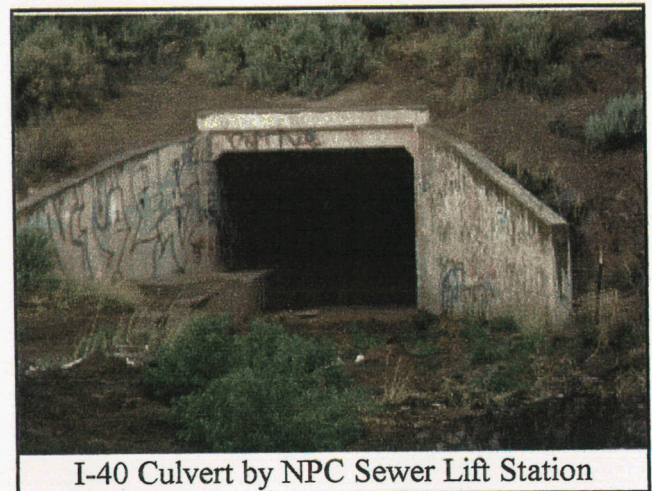
International Petrified Forest



Keams Canyon Interchange Looking North



NPC Sewer Lift Station



I-40 Culvert by NPC Sewer Lift Station



3



## Section 3 - Current and Future Water Flow Projections

Through several weeks of interviewing the current land and business owners extending from the eastern City limits out to the Keams Canyon interchange, a listing of current and potential future water needs was developed. These total water needs are shown on Table 3-1, Summary of Total Existing and Projected Water Needs.

These water needs were then grouped into general areas and are shown on Drawing 3-1 and Drawing 3-2, Area Number Map.

These water needs were then broken down into existing water needs, projected water needs in 5 years, projected water needs in 10 years, and projected water needs in 15 years. These water needs are broken down by area and are shown on the following tables which follow this page:

- Table 3-2, Summary of Existing Water Needs
- ▶ Table 3-3, Summary of Phase 1 Water Needs (0 to 5 Years)
- ▶ Table 3-4, Summary of Phase 2 Water Needs (5 to 10 Years)
- ▶ Table 3-5, Summary of Phase 3 Water Needs (10 to 15 Years)



**Table 3-1, Summary of Total Existing and Projected Water Needs**

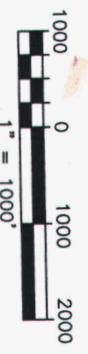
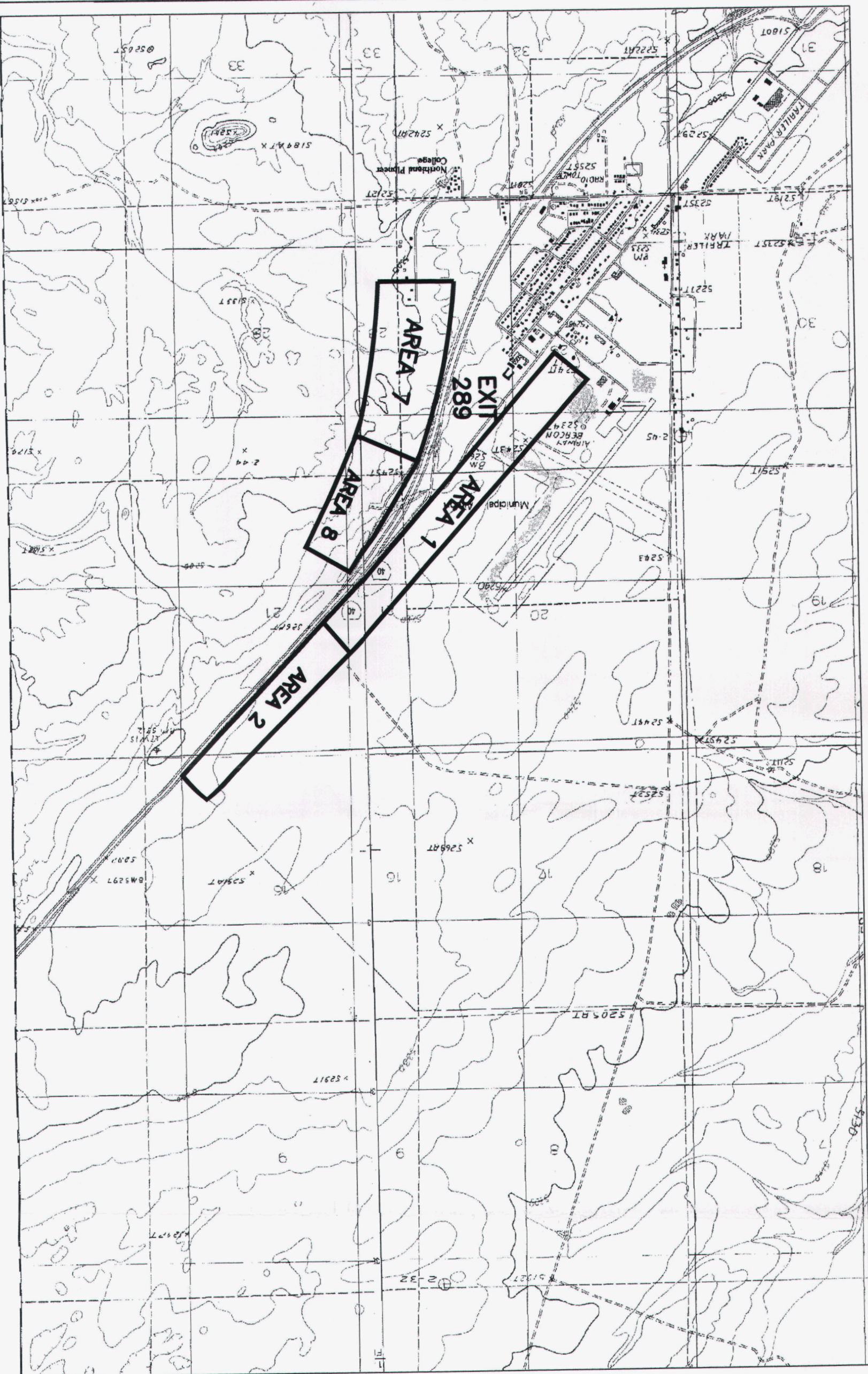
Area No. on Map	Information Source	Location	Main Description	Estimated Unit Flow	Estimated Unit Flow	Estimated Total Area Flow	Estimated Total Area Flow
				GPD	GPM	GPD	GPM
1	City / Bill Jeffers	North Side of I-40 by Airport	(30) 1 Ac Commercial Lots	24,000	40.00	24,000	40.00
2	Bill Jeffers	North Side of I-40 by Airport	(10) 5 Ac Ranches	8,000	13.33	8,000	13.33
3	Marvin Hatch	North Side of I-40	(10) 5 Ac Ranches	8,000	11.11	8,000	11.11
4	Dale Phillips	Keams Canyon - North Side	Existing Truck Stop Existing Water Consumption Additional Water Needs Now	33,333 33,333	69.44 69.44	66,666	138.89
5	Gary Darling	Keams Canyon - North Side	Opposite of existing truck stop 100 Room Motel 100 Person Sit-down Restaurant C Store with Gas & Fast Food 50 Space RV Park for Passenger Cars Small Park w/ Restroom & Grass Area Big Rig RV Park 100 Spaces, Showers, Restrooms Laundry Facility	5,600 5,000 3,300 5,800 1,000	11.67 4.63 3.06 12.08 16.67	35,050	78.00
6	Gary Scaram (Hatch)	Keams Canyon - South Side	International Petrified Forest Existing Use Hydroponics Planting 140 Room Motel 125 Person Sit-down Restaurant Fast Food Restaurant	1,000 3,000 7,840 6,250 2,250	2.08 2.08 16.33 5.79 2.08	20,340	28.37
7	Gary Scaram (Hatch)	Exit 289 - South Side	(16) 5 Ac Ranches	12,800	17.78	12,800	17.78
8	Gary Scaram (Hatch)	Exit 289 - South Side	Truck Stop Gas Station Truck Wash 125 Person Sit-down Restaurant 50 Space RV Park	1,050 10,000 6,250 5,800	0.97 20.83 5.79 12.08	23,100	39.68
<b>Total Flows</b>				<b>197,956</b>	<b>367.15</b>	<b>197,956</b>	<b>367.15</b>





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REVISIONS		DATE	APVD
ZONE	REV	DESCRIPTION	



**C5 Engineering, Inc.**  
NORTH SALT LAKE, UTAH  
(801) 296-1562

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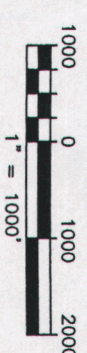
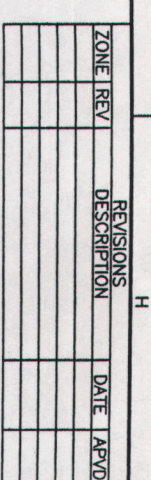
JOB No. 1035  
DATE SEP 4, 1989

**CITY OF HOLBROOK**  
SHIPLEY-PHILLIPS INTERCHANGE UTILITY FEASIBILITY STUDY

**AREA NUMBER MAP**

DRAWING NUMBER **3-1**  
SHEET H





DRAWING NUMBER	3-2
SHEET	



**Table 3-2, Summary of Existing Water Needs**

Area No. on Map	Information Source	Location	Main Description	Existing Estimated Total GPD	Existing Estimated Total GPM
1	City / Bill Jeffers	North Side of I-40 by Airport	(30) 1 Ac Commercial Lots		
2	Bill Jeffers	North Side of I-40 by Airport	(10) 5 Ac Ranches		
3	Marvin Hatch	North Side of I-40	(10) 5 Ac Ranches		
4	Dale Phillips	Keams Canyon - North Side	Existing Truck Stop	33,333	69.44
5	Gary Darling	Keams Canyon - North Side	Opposite of existing truck stop		
6	Gary Scaram (Hatch)	Keams Canyon - South Side	International Petrified Forest	1,000	2.08
7	Gary Scaram (Hatch)	Exit 289 - South Side	(16) 5 Ac Ranches		
8	Gary Scaram (Hatch)	Exit 289 - South Side	Truck Stop		
<b>Total Flows</b>				<b>34,333</b>	<b>71.53</b>



**Table 3-3, Summary of Phase 1 Water Needs (0 to 5 Years)**

Area No. on Map	Information Source	Location	Main Description	0 to 5 Yrs Estimated Total GPD	0 to 5 Yrs Estimated Total GPM
1	City / Bill Jeffers	North Side of I-40 by Airport	(30) 1 Ac Commercial Lots	24,000	40.00
2	Bill Jeffers	North Side of I-40 by Airport	(10) 5 Ac Ranches		
3	Marvin Hatch	North Side of I-40	(10) 5 Ac Ranches		
4	Dale Phillips	Keams Canyon - North Side	Existing Truck Stop	66,666	138.89
5	Gary Darling	Keams Canyon - North Side	Opposite of existing truck stop	8,900	14.72
6	Gary Scaram (Hatch)	Keams Canyon - South Side	International Petrified Forest	3,250	4.17
7	Gary Scaram (Hatch)	Exit 289 - South Side	(16) 5 Ac Ranches		
8	Gary Scaram (Hatch)	Exit 289 - South Side	Truck Stop	5,800	12.08
<b>Total Flows</b>				<b>108,616</b>	<b>209.86</b>



**Table 3-4, Summary of Phase 2 Water Needs (5 to 10 Years)**

Area No. on Map	Information Source	Location	Main Description	5 to 10 Yrs Estimated Total GPD	5 to 10 Yrs Estimated Total GPM
1	City / Bill Jeffers	North Side of I-40 by Airport	(30) 1 Ac Commercial Lots	24,000	40.00
2	Bill Jeffers	North Side of I-40 by Airport	(10) 5 Ac Ranches	8,000	13.33
3	Marvin Hatch	North Side of I-40	(10) 5 Ac Ranches	8,000	11.11
4	Dale Phillips	Keams Canyon - North Side	Existing Truck Stop	66,666	138.89
5	Gary Darling	Keams Canyon - North Side	Opposite of existing truck stop	13,900	19.35
6	Gary Scaram (Hatch)	Keams Canyon - South Side	International Petrified Forest	9,500	9.95
7	Gary Scaram (Hatch)	Exit 289 - South Side	(16) 5 Ac Ranches		
8	Gary Scaram (Hatch)	Exit 289 - South Side	Truck Stop	16,850	33.89
<b>Total Flows</b>				<b>146,916</b>	<b>266.53</b>



**Table 3-5, Summary of Phase 3 Water Needs (10 to 15 Years)**

Area No. on Map	Information Source	Location	Main Description	10 to 15 Yrs Estimated Total GPD	10 to 15 Yrs Estimated Total GPM
1	City / Bill Jeffers	North Side of I-40 by Airport	(30) 1 Ac Commercial Lots	24,000	40.00
2	Bill Jeffers	North Side of I-40 by Airport	(10) 5 Ac Ranches	8,000	13.33
3	Marvin Hatch	North Side of I-40	(10) 5 Ac Ranches	8,000	11.11
4	Dale Phillips	Keams Canyon - North Side	Existing Truck Stop	66,666	138.89
5	Gary Darling	Keams Canyon - North Side	Opposite of existing truck stop	35,050	78.00
6	Gary Scaram (Hatch)	Keams Canyon - South Side	International Petrified Forest	20,340	28.37
7	Gary Scaram (Hatch)	Exit 289 - South Side	(16) 5 Ac Ranches	12,800	17.78
8	Gary Scaram (Hatch)	Exit 289 - South Side	Truck Stop	23,100	39.68
<b>Total Flows</b>				<b>197,956</b>	<b>367.15</b>



The following table summarizes the water needs of the previous tables by yearly phases:

<b>Table 3-6, Summary of Phased Water Needs</b>				
Flow Rate	Existing Flows	Phase 1 Flows (0 to 5 Years)	Phase 2 Flows (5 to 10 Years)	Phase 3 Flows (10 to 15 Years)
Gallons Per Day (GPD)	34,333	108,616	146,916	197,956
Gallons Per Minute (GPM)	72	210	267	367



**Table 3-2, Summary of Existing Water Needs**

Area No. on Map	Information Source	Location	Main Description	Existing Estimated Total GPD	Existing Estimated Total GPM
1	City / Bill Jeffers	North Side of I-40 by Airport	(30) 1 Ac Commercial Lots		
2	Bill Jeffers	North Side of I-40 by Airport	(10) 5 Ac Ranches		
3	Marvin Hatch	North Side of I-40	(10) 5 Ac Ranches		
4	Dale Phillips	Keams Canyon - North Side	Existing Truck Stop	33,333	69.44
5	Gary Darling	Keams Canyon - North Side	Opposite of existing truck stop		
6	Gary Scaram (Hatch)	Keams Canyon - South Side	International Petrified Forest	1,000	2.08
7	Gary Scaram (Hatch)	Exit 289 - South Side	(16) 5 Ac Ranches		
8	Gary Scaram (Hatch)	Exit 289 - South Side	Truck Stop		
<b>Total Flows</b>				<b>34,333</b>	<b>71.53</b>



**Table 3-3, Summary of Phase 1 Water Needs (0 to 5 Years)**

Area No. on Map	Information Source	Location	Main Description	0 to 5 Yrs Estimated Total GPD	0 to 5 Yrs Estimated Total GPM
1	City / Bill Jeffers	North Side of I-40 by Airport	(30) 1 Ac Commercial Lots	24,000	40.00
2	Bill Jeffers	North Side of I-40 by Airport	(10) 5 Ac Ranches		
3	Marvin Hatch	North Side of I-40	(10) 5 Ac Ranches		
4	Dale Phillips	Keams Canyon - North Side	Existing Truck Stop	66,666	138.89
5	Gary Darling	Keams Canyon - North Side	Opposite of existing truck stop	8,900	14.72
6	Gary Scaram (Hatch)	Keams Canyon - South Side	International Petrified Forest	3,250	4.17
7	Gary Scaram (Hatch)	Exit 289 - South Side	(16) 5 Ac Ranches		
8	Gary Scaram (Hatch)	Exit 289 - South Side	Truck Stop	5,800	12.08
<b>Total Flows</b>				<b>108,616</b>	<b>209.86</b>



**Table 3-4, Summary of Phase 2 Water Needs (5 to 10 Years)**

Area No. on Map	Information Source	Location	Main Description	5 to 10 Yrs Estimated Total GPD	5 to 10 Yrs Estimated Total GPM
1	City / Bill Jeffers	North Side of I-40 by Airport	(30) 1 Ac Commercial Lots	24,000	40.00
2	Bill Jeffers	North Side of I-40 by Airport	(10) 5 Ac Ranches	8,000	13.33
3	Marvin Hatch	North Side of I-40	(10) 5 Ac Ranches	8,000	11.11
4	Dale Phillips	Kearns Canyon - North Side	Existing Truck Stop	66,666	138.89
5	Gary Darling	Kearns Canyon - North Side	Opposite of existing truck stop	13,900	19.35
6	Gary Scaram (Hatch)	Kearns Canyon - South Side	International Petrified Forest	9,500	9.95
7	Gary Scaram (Hatch)	Exit 289 - South Side	(16) 5 Ac Ranches		
8	Gary Scaram (Hatch)	Exit 289 - South Side	Truck Stop	16,850	33.89
<b>Total Flows</b>				<b>146,916</b>	<b>266.53</b>



**Table 3-5, Summary of Phase 3 Water Needs (10 to 15 Years)**

Area No. on Map	Information Source	Location	Main Description	10 to 15 Yrs Estimated Total GPD	10 to 15 Yrs Estimated Total GPM
1	City / Bill Jeffers	North Side of I-40 by Airport	(30) 1 Ac Commercial Lots	24,000	40.00
2	Bill Jeffers	North Side of I-40 by Airport	(10) 5 Ac Ranches	8,000	13.33
3	Marvin Hatch	North Side of I-40	(10) 5 Ac Ranches	8,000	11.11
4	Dale Phillips	Keams Canyon - North Side	Existing Truck Stop	66,666	138.89
5	Gary Darling	Keams Canyon - North Side	Opposite of existing truck stop	35,050	78.00
6	Gary Scaram (Hatch)	Keams Canyon - South Side	International Petrified Forest	20,340	28.37
7	Gary Scaram (Hatch)	Exit 289 - South Side	(16) 5 Ac Ranches	12,800	17.78
8	Gary Scaram (Hatch)	Exit 289 - South Side	Truck Stop	23,100	39.68
<b>Total Flows</b>				<b>197,956</b>	<b>367.15</b>

The following table summarizes the water needs of the previous tables by yearly phases:

<b>Table 3-6, Summary of Phased Water Needs</b>				
Flow Rate	Existing Flows	Phase 1 Flows (0 to 5 Years)	Phase 2 Flows (5 to 10 Years)	Phase 3 Flows (10 to 15 Years)
Gallons Per Day (GPD)	34,333	108,616	146,916	197,956
Gallons Per Minute (GPM)	72	210	267	367



4



## Section 4 - Conceptual Future Water Facilities

To determine the required pipe sizes, required booster pumping stations, bladder tanks, etc. the proposed water system was computer modeled using the flows developed in Section 3. A summary of the system flows (GPM) and pressures (PSI) for gravity and normal consumption flows is summarized in the following tables:

**Table 4-1, Gravity Flows From Existing Elevated Water Tank**

Flow Condition	Demand @ Airport	Demand @ High Point (Hill)	Demand @ Keams Canyon Interchange
GPM	64	0	303
PSI	49	9	27

**Table 4-2, Gravity Flows From Existing Elevated Water Tank**

Flow Condition	Demand @ Airport	Demand @ High Point (Hill)	Demand @ Keams Canyon Interchange
GPM	5	0	25
PSI	54	22	43

**Table 4-3, Normal Flows with New Booster Pumping Station**

Flow Condition	Demand @ Airport	Demand @ High Point (Hill)	Demand @ Keams Canyon Interchange
GPM	64	0	303
PSI	87	47	65

From the above tables it is shown that a booster pumping station is required to maintain the City required 65 psi water pressure out at Keams Canyon.

Analyzing the water flows developed above, it was determined that the following four options should be analyzed to transport potable water out to the Keams Canyon Interchange area:

### **Water Option 1 - New 8-inch Water Pipeline without Fire Protection and without Bladder Tanks**

Construct a new booster pumping station and an 8-inch water pipeline to transport potable water from the



City out to the Keams Canyon Interchange. The general pipeline alignment is as shown on Drawing 4-1 and Drawing 4-2, Future Water System.

**Water Option 2 - New 8-inch Water Pipeline without Fire Protection and with Bladder Tanks**

Construct a new booster pumping station and an 8-inch water pipeline to transport potable water from the City out to the Keams Canyon Interchange. Out at the Keams Canyon interchange install two buried 500 gallon bladder tanks to minimize pump on/off cycles during low flow situations. The general pipeline alignment is as shown on Drawing 4-1 and Drawing 4-2, Future Water System.

**Water Option 3 - New 8-inch Water Pipeline with Fire Protection and without Bladder Tanks**

Construct a new booster pumping station and an 8-inch water pipeline to transport potable water from the City out to the Keams Canyon Interchange. Out at the Keams Canyon interchange install the City's two existing 25,000 gallon above ground, steel, potable water tanks along with a new 1000 gpm fire pump. This arrangement will furnish a 1000 gpm fire flow for approximately one hour. The general pipeline alignment is as shown on Drawing 4-1 and Drawing 4-2, Future Water System.

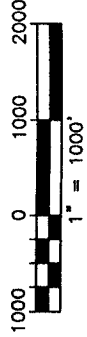
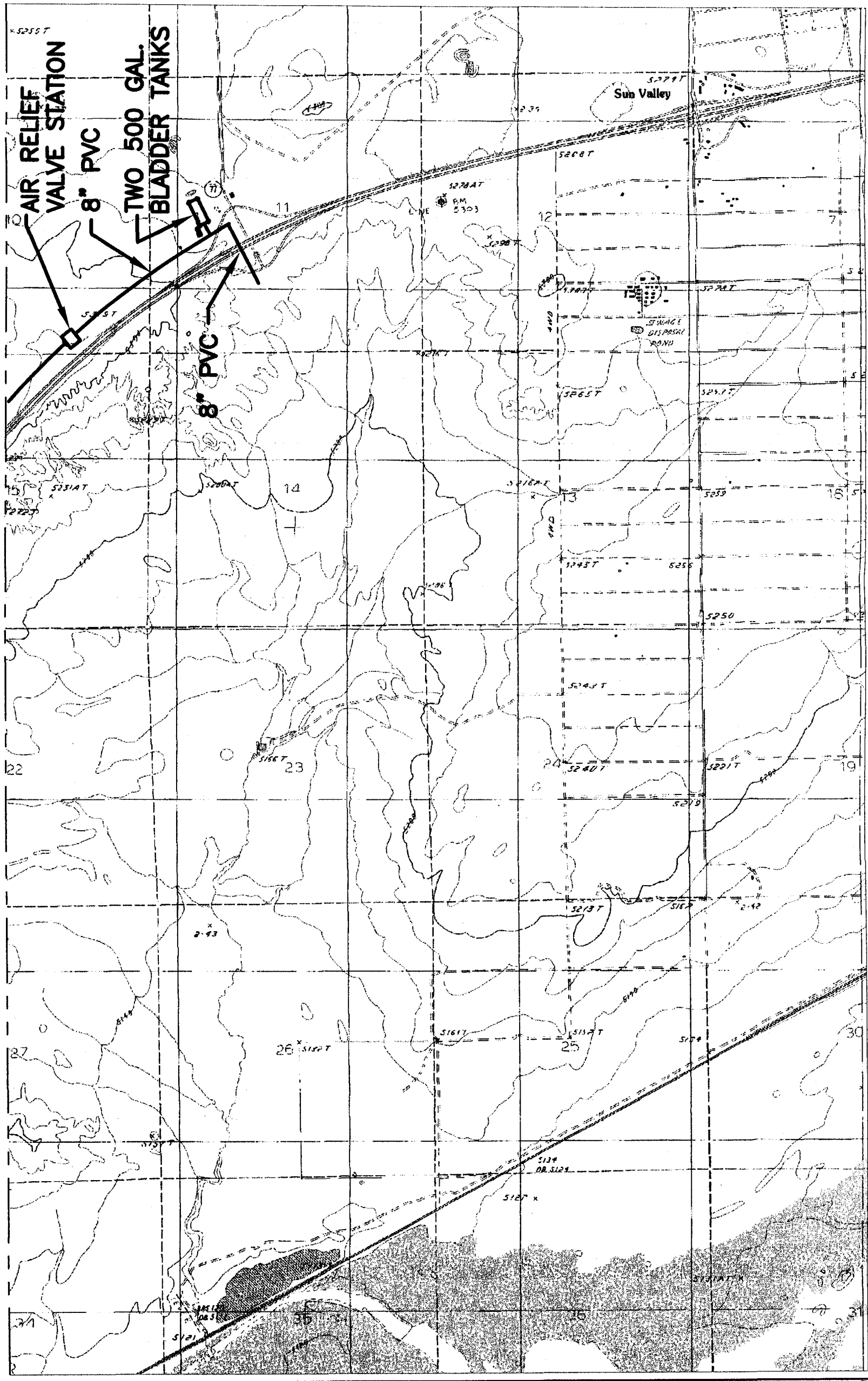
**Water Option 4 - New 8-inch Water Pipeline with Fire Protection and with Bladder Tanks**

Construct a new booster pumping station and an 8-inch water pipeline to transport potable water from the City out to the Keams Canyon Interchange. Out at the Keams Canyon interchange install the City's two existing 25,000 gallon above ground, steel, potable water tanks along with a new 1000 gpm fire pump. This arrangement will furnish a 1000 gpm fire flow for approximately one hour. In addition, out at the Keams Canyon interchange install two buried 500 gallon bladder tanks to minimize pump on/off cycles during low flow situations. The general pipeline alignment is as shown on Drawing 4-1 and Drawing 4-2, Future Water System.



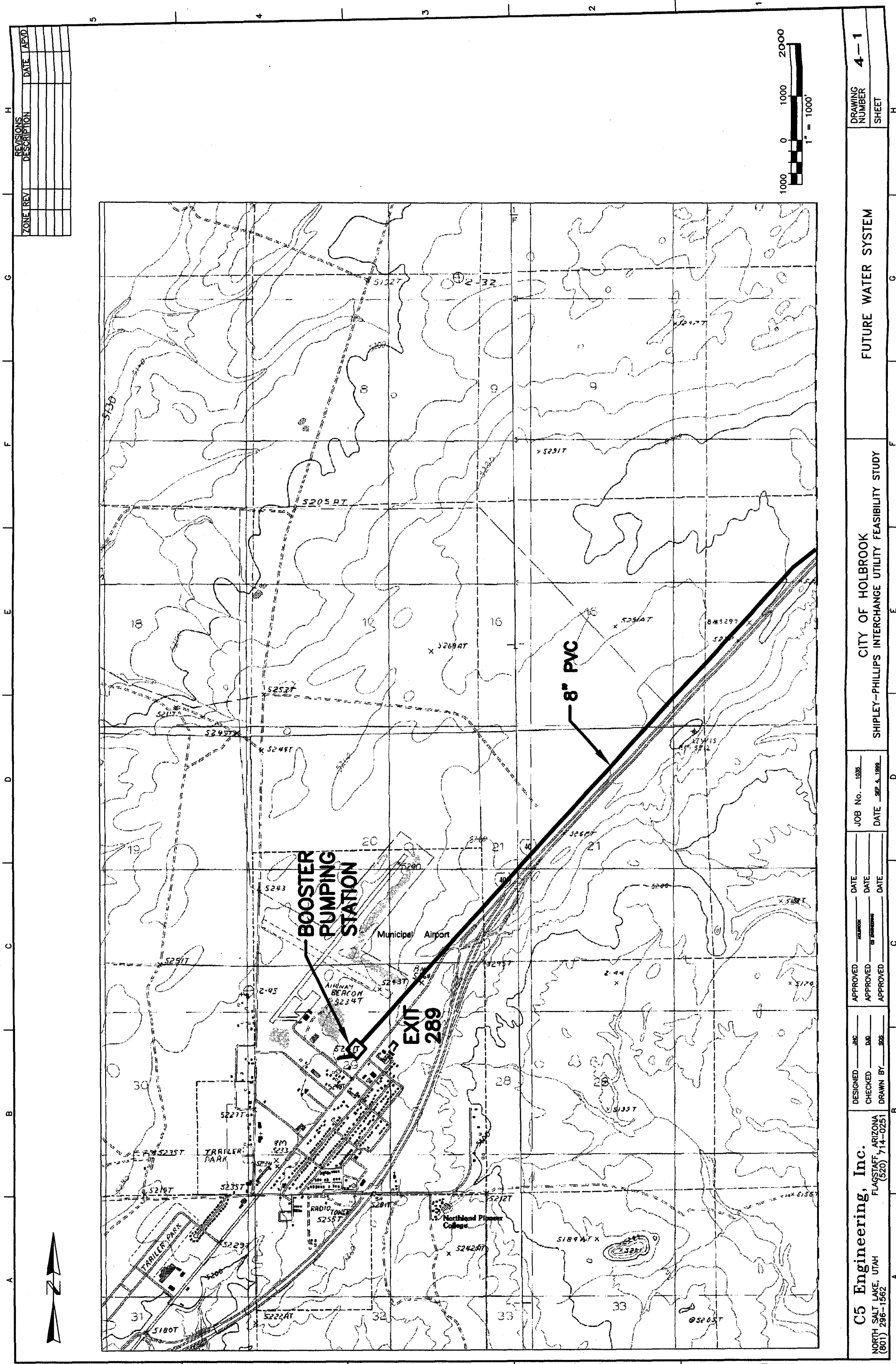
ZONE	REV.	DESCRIPTION	DATE	APPROVED

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<b>C5 Engineering, Inc.</b> FLAGSTAFF, ARIZONA (801) 298-1562	DESIGNED <u>JHC</u> CHECKED <u>DJD</u> DRAWN BY <u>SJS</u>	APPROVED _____ APPROVED _____ APPROVED _____	DATE _____ DATE _____ DATE _____	JOB No. <u>118 1030</u> DATE <u>SEP 4, 1988</u>	CITY OF HOLBROOK SHIPLEY-PHILLIPS INTERCHANGE UTILITY FEASIBILITY STUDY	FUTURE WATER SYSTEM	DRAWING NUMBER <u>4-2</u> SHEET

ZONE	REV	REVISIONS		DATE	APPROVED
		DESCRIPTION			



<b>C5 Engineering, Inc.</b> NORTH SALT LAKE, UTAH (801) 296-1562	DESIGNED _____ CHECKED _____ DRAWN BY _____	APPROVED _____ APPROVED _____ APPROVED _____	DATE _____ DATE _____ DATE _____	JOB No. 1035 DATE SEP 4, 1988	CITY OF HOLBROOK SHIPLEY-PHILLIPS INTERCHANGE UTILITY FEASIBILITY STUDY	FUTURE WATER SYSTEM	DRAWING NUMBER 4-1 SHEET
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5

## Section 5 - Current and Future Wastewater Flow Projections

The City keeps track of the wastewater flows generated by the Keams Canyon truck terminal. Over a one year time period this facility generated approximately 10,745,000 gallons and did so at a fairly consistent rate. Using this yearly wastewater production rate, an average daily wastewater production flow rate of 29,500 gallons was calculated. Using this daily wastewater production flow rate (29,500 GPD) and dividing by the daily average water consumption flow rate (33,333 GPD) leads to a water to wastewater ratio of 0.89 or approximately 90% of the water consumed is converted into wastewater. Using this water to wastewater conversion factor, the wastewater production rates can now be calculated for the Keams Canyon Interchange area using the water consumption rates.

Specific areas that would contribute wastewater flows that could either flow into a new sewer interceptor or into a reuse water treatment plant include (please refer to Drawing 3-2 for area number locations):

- Area 3, North side of I-40 just west of the Keams Canyon Interchange
- Area 4, the existing truck stop at the Keams Canyon Interchange
- Area 5, the area due east of the existing truck stop at the Keams Canyon Interchange
- Area 6, the International Petrified Forest area

**Table 5 -1, Phased Wastewater Flows for Keams Canyon Interchange**

Flow Rate	Existing Flows	Phase 1 Flows (0 to 5 Yrs)	Phase 2 Flows (5 to 10 Yrs)	Phase 3 Flows (10 to 15 Yrs)
Gallons Per Day (GPD)	30,000	71,000	88,300	117,100
Gallons Per Minute (GPM)	62	142	161	231



6

## **Section 6 - Conceptual Future Wastewater Facilities**

Analyzing the wastewater flows developed in Section 5, it was determined that the following three options should be analyzed to either process and reuse or transport the sewage produced at the Keams Canyon Interchange area:

### **Option 1, 2, and 3 - New Sewer Interceptor** (only services north side of freeway)

Construct a new 6-inch, 8-inch or 10-inch PVC sewer interceptor to transport the sewage from the Keams Canyon Interchange to the City's existing collection system. The general interceptor alignment is as shown on Drawing 6-1 and Drawing 6-2, Proposed New Sewer Interceptor.

### **Option 4 - New Water Reclamation Facility** (services both sides of freeway)

Construct a new 150,000 GPD water reclamation plant on the south side of I-40 for the purposes of treating and reusing the wastewater as a source of irrigation water. This concept would then require hauling the sludge generated at the plant to the Painted Mesa Water Reclamation Facility for final processing and disposal. The general water reclamation plant is as shown on Drawing 6-3, Proposed New Water Reclamation Facility.

### **Option 5 - Modify the Existing Sewer Pumping Stations and Forcemain System**

Upgrade the two existing sewer pumping stations by constructing new, larger wet wells at each station and adding one more pump at each station for a total of three pumps per station. The existing 4-inch forcemain would be used as-is. The general existing forcemain alignment and pumping stations are as shown on Drawing 6-4 and Drawing 6-5, Upgraded Sewer Forcemain System.

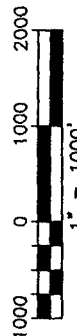
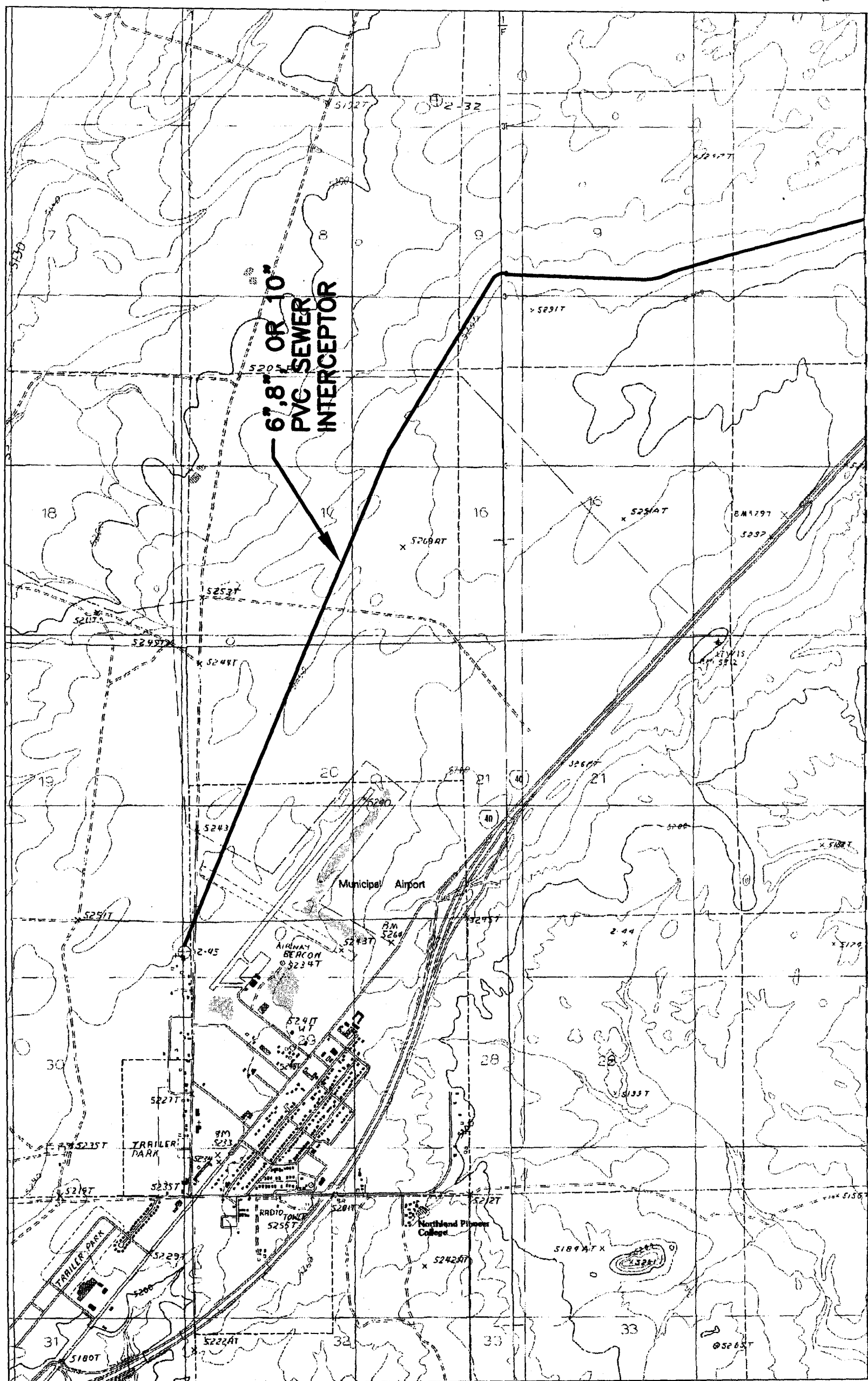
### **Option 6 - Modify the Existing Sewer Pumping Stations and Forcemain System and Add Service to the South Side of the Freeway**

This is the same as Option 5 above plus adding a new sewer lift station at the International Petrified Forest and a forcemain connecting that lift station to the Shipley-Phillips Lift Station #1.



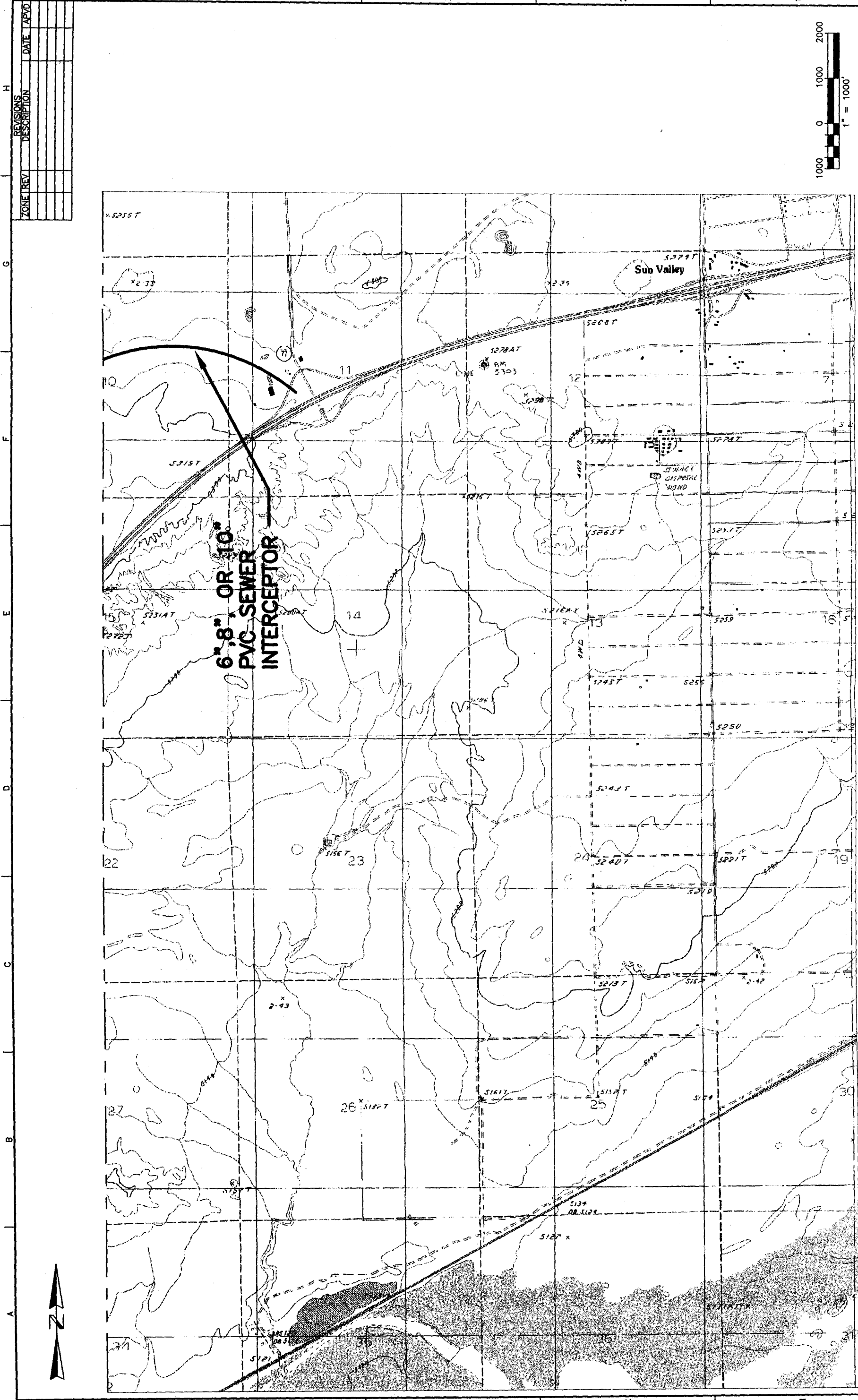
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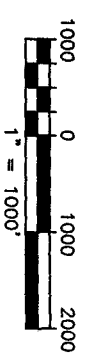
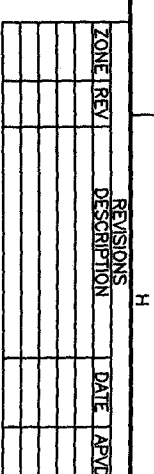
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		DESCRIPTION		



<b>C5 Engineering, Inc.</b> NORTH SALT LAKE, UTAH (801) 296-1562	DESIGNED BY: JMC CHECKED BY: JMC DRAWN BY: JMC	APPROVED: _____ DATE: _____ APPROVED: _____ DATE: _____ APPROVED: _____ DATE: _____	JOB No. 1030 DATE SEP 4, 1992	CITY OF HOLBROOK SHIPLEY-PHILLIPS INTERCHANGE UTILITY FEASIBILITY STUDY	NEW SEWER INTERCEPTOR	DRAWING NUMBER 6-2 SHEET





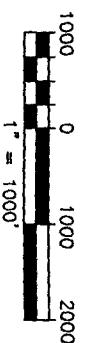
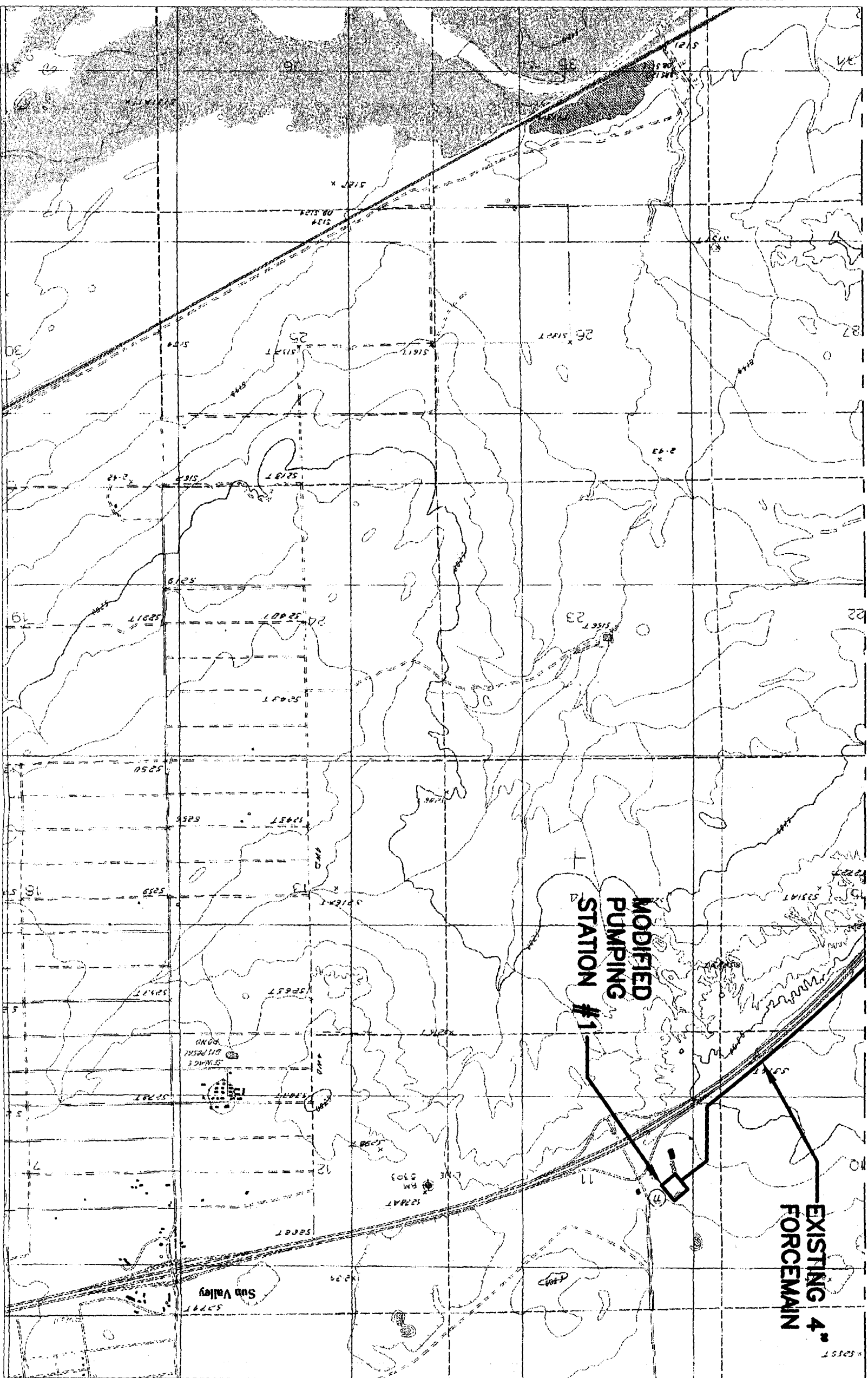


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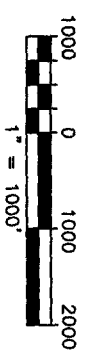
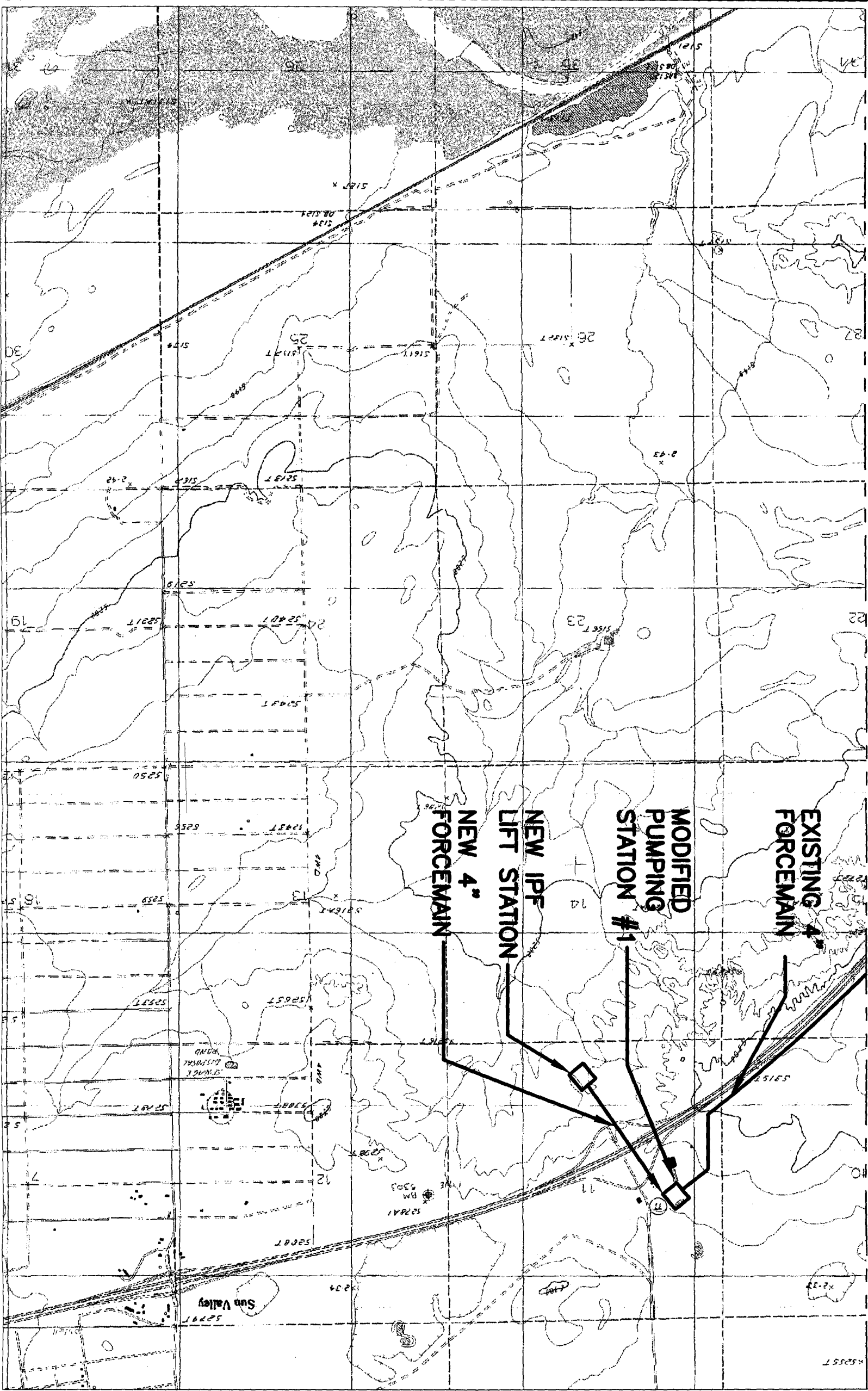
REVISIONS			DATE	APPROVED
ZONE	REV	DESCRIPTION		



<b>C5 Engineering, Inc.</b>		<b>DESIGNED</b> _____ <b>DATE</b> _____		<b>JOB No.</b> _____ <b>DATE</b> _____		<b>CITY OF HOLBROOK</b>		<b>UPGRADED SEWER FORCEMAIN SYSTEM</b>		<b>DRAWING NUMBER</b> 6-5	
NORTH SALT LAKE, UTAH		<b>CHECKED</b> _____ <b>DATE</b> _____		<b>APPROVED</b> _____ <b>DATE</b> _____		SHIPLEY-PHILLIPS INTERCHANGE UTILITY FEASIBILITY STUDY				<b>SHEET</b>	
(801) 286-1562		FLAGSTAFF, ARIZONA		DRAWN BY _____							
		(320) 714-0251									



REVISIONS		DATE	APVD
ZONE	REV	DESCRIPTION	



<b>C5 Engineering, Inc.</b> NORTH SALT LAKE, UTAH (801) 296-1562		DESIGNED <u>          </u> JAC CHECKED <u>          </u> JAC DRAWN BY <u>          </u> JAC	APPROVED <u>          </u> JAC DATE <u>          </u>	JOB No. <u>          </u> 1030 DATE <u>          </u> 8/1/89	CITY OF HOLBROOK SHIPLEY-PHILLIPS INTERCHANGE UTILITY FEASIBILITY STUDY		UPGRADED SEWER FORCEMAIN SYSTEM	DRAWING NUMBER <u>          </u> 6-6 SHEET <u>          </u>
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7

## Section 7 - Conceptual Construction Cost Estimates

The final section of this report outlines the conceptual construction costs for the proposed water and wastewater system options. The following table summarizes these costs.

**Table 7-1, Conceptual Construction Material  
and Engineering Cost Estimate Summary**

Option Number	Description	Total Conceptual Construction Material and Engineering Costs
Water Option 1	New 8-inch Water Pipeline without Fire Protection and without Bladder Tanks	\$303,887
Water Option 2	New 8-inch Water Pipeline without Fire Protection and with Bladder Tanks	\$309,487
Water Option 3	New 8-inch Water Pipeline with Fire Protection and without Bladder Tanks	\$341,632
Water Option 4	New 8-inch Water Pipeline with Fire Protection and with Bladder Tanks	\$347,232
Wastewater Option 1	New 6-inch Sewer Interceptor	\$149,818
Wastewater Option 2	New 8-inch Sewer Interceptor	\$180,022
Wastewater Option 3	New 10-inch Sewer Interceptor	\$224,010
Wastewater Option 4	New Water Reclamation Facility	\$745,086
Wastewater Option 5	Modify the Existing Sewer Pumping Stations and Forcemain System	\$45,537
Wastewater Option 6	Modify the Existing Sewer Pumping Stations and Forcemain System and Add Service to the South Side of the Freeway (services both sides of freeway)	\$140,155

The following tables outline the water and wastewater system options and the conceptual construction and engineering costs for the proposed water and wastewater system options. For a detailed breakdown of these costs please see the pages following this section.



**Water Option #1**

**New 8-inch Water Pipeline without Fire Protection and without Bladder Tanks**

Conceptual Construction Material Cost	Conceptual Engineering Cost	Conceptual Total Project Cost
\$262,557	\$41,330	\$303,887

22,000 feet of 8-inch PVC water pipe buried at an average depth of four feet.

Pipe jacking and casing under freeway.

A booster pumping station near the base of the existing elevated water storage tank.

Miscellaneous valves and fittings.

Miscellaneous electrical.

Two air relief stations to vent high points in the pipeline.

Three fire hydrants (one each for the NW, NE, and SE freeway and Keams intersections).

Includes 15-percent contingency.

Serves both sides of the freeway.

### Water Option #2

#### New 8-inch Water Pipeline without Fire Protection and with Bladder Tanks

Conceptual Construction Material Cost	Conceptual Engineering Cost	Conceptual Total Project Cost
\$267,157	\$42,330	\$309,487

22,000 feet of 8-inch PVC water pipe buried at an average depth of four feet.

Pipe jacking and casing under freeway.

A booster pumping station near the base of the existing elevated water storage tank.

Miscellaneous valves and fittings.

Miscellaneous electrical.

Two 500 gallon bladder tanks for low flow situations (to minimize pump on/off cycles).

Two air relief stations to vent high points in the pipeline.

Three fire hydrants (one each for the NW, NE, and SE freeway and Keams intersections).

Includes 15-percent contingency.

Serves both sides of the freeway.



### Water Option #3

#### New 8-inch Water Pipeline with Fire Protection and without Bladder Tanks

Conceptual Construction Material Cost	Conceptual Engineering Cost	Conceptual Total Project Cost
\$292,802	\$48,830	\$341,632

22,000 feet of 8-inch PVC water pipe buried at an average depth of four feet.

Pipe jacking and casing under freeway.

A booster pumping station near the base of the existing elevated water storage tank.

Miscellaneous valves and fittings.

Miscellaneous electrical.

Minimal fire protection = Install City's two existing 25,000 gallon water tanks on new concrete pads, install one new 75 HP electric 1000 gpm fire pump on a new concrete pad in a new small enclosure and heat trace the piping and valves (if desired to supply 1000 gpm fire flow for approximately one hour). This will be installed at Keams Canyon.

Two air relief stations to vent high points in the pipeline.

Three fire hydrants (one each for the NW, NE, and SE freeway and Keams intersections).

Includes 15-percent contingency.

Serves both sides of the freeway.

#### Water Option #4

##### New 8-inch Water Pipeline with Fire Protection and with Bladder Tanks

Conceptual Construction Material Cost	Conceptual Engineering Cost	Conceptual Total Project Cost
\$297,402	\$49,830	\$347,232

22,000 feet of 8-inch PVC water pipe buried at an average depth of four feet.

Pipe jacking and casing under freeway.

A booster pumping station near the base of the existing elevated water storage tank.

Miscellaneous valves and fittings.

Miscellaneous electrical.

Minimal fire protection = Install City's two existing 25,000 gallon water tanks on new concrete pads, install one new 75 HP electric 1000 gpm fire pump on a new concrete pad in a new small enclosure and heat trace the piping and valves (if desired to supply 1000 gpm fire flow for approximately one hour). This will be installed at Keams Canyon.

Two 500 gallon bladder tanks for low flow situations (to minimize pump on/off cycles).

Two air relief stations to vent high points in the pipeline.

Three fire hydrants (one each for the NW, NE, and SE freeway and Keams intersections).

Includes 15-percent contingency.

Serves both sides of the freeway.



**Wastewater Option #1  
New 6-inch Gravity Sewer Interceptor**

Conceptual Construction Material Cost	Conceptual Engineering Cost	Conceptual Total Project Cost
\$115,242	\$34,576	\$149,818

25,500 feet of 6-inch PVC gravity sewer pipeline buried at an average depth of 4-feet.

64 sewer manholes spaced every 400 feet.

Includes 15-percent contingency.

Only services the north side of the freeway.

**Wastewater Option #2  
New 8-inch Gravity Sewer Interceptor**

Conceptual Construction Material Cost	Conceptual Engineering Cost	Conceptual Total Project Cost
\$145,446	\$34,576	\$180,022

25,500 feet of 8-inch PVC gravity sewer pipeline buried at an average depth of 4-feet.

64 sewer manholes spaced every 400 feet.

Includes 15-percent contingency.

Only services the north side of the freeway.

**Wastewater Option #3  
New 10-inch Gravity Sewer Interceptor**

Conceptual Construction Material Cost	Conceptual Engineering Cost	Conceptual Total Project Cost
\$189,434	\$34,576	\$224,010

25,500 feet of 10-inch PVC gravity sewer pipeline buried at an average depth of 4-feet.

64 sewer manholes spaced every 400 feet.

Includes 15-percent contingency.

Only services the north side of the freeway.

**Wastewater Option #4  
New Water Reclamation Facility**

Conceptual Construction Material Cost	Conceptual Engineering Cost	Conceptual Total Project Cost
\$626,123	\$118,963	\$745,086

8-inch PVC sewer pipeline from the north side of I-40 to the treatment plant.

Pipe jacking and casing under freeway.

4 sewer manholes.

150,000 GPD package water reclamation plant that denitrifies.

12 million gallon unlined reuse storage pond.

8-inch PVC reuse distribution piping.

Miscellaneous electrical.

Includes 15-percent contingency.

Services both sides of the freeway.



**Wastewater Option #5**  
**Upgrade Existing Forcemain Pumping Stations**

Conceptual Construction Material Cost	Conceptual Engineering Cost	Conceptual Total Project Cost
\$33,037	\$12,500	\$45,537

New wet wells, supporting members and grating

One new, additional pump per pumping station

Miscellaneous valves and fittings.

Simple wood enclosures for pumping stations.

Concrete pad for wood enclosures.

Miscellaneous electrical.

Includes 15-percent contingency.

Only services the north side of the freeway.

**Wastewater Option #6****Upgrade Existing Forcemain Pumping Stations and Add Service to South Side of Freeway**

Conceptual Construction Material Cost	Conceptual Engineering Cost	Conceptual Total Project Cost
\$117,355	\$22,800	\$140,155

New wet wells, supporting members and grating

One new, additional pump per pumping station

Miscellaneous valves and fittings.

Simple wood enclosures for pumping stations.

Concrete pad for wood enclosures.

Miscellaneous electrical.

Add new sewer lift station on south side of freeway.

Pipe jacking and casing under freeway.

4-inch PVC forcemain from the south side of the freeway to the new (refurbished) Shipley-Phillips Lift Station #1.

Includes 15-percent contingency.

Serves both sides of the freeway.



City of Holbrook  
 Keams Canyon / I-40 Interchange Utility Feasibility Study  
 Water Option #1  
 Revised September 5, 1999

Description	Qty	Unit	Budget Unit \$ 1999	Total
8-inch PVC C900	22,000	LF	5.76	\$126,720
Pipe Jacking and Casing Under Freeway	300	LF	200.00	\$60,000
Booster Pumping Station				
Duplex 25 HP Pumps with Controls	1	LS	23,890.00	\$23,890
Concrete Pad	1	LS	600.00	\$600
Misc. Piping and Valves	1	LS	1,000.00	\$1,000
Simple 8' x 8' Wood Enclosure	1	LS	2,000.00	\$2,000
Electrical	1	LS	1,000.00	\$1,000
Misc. Valves and Fittings	1	LS	1,000.00	\$1,000
Air Relief Station	2	LS	3,800.00	\$7,600
Fire Hydrant	3	LS	1,500.00	\$4,500
Subtotal				\$228,310
15-Percent Contingency				\$34,247
Grand Total				\$262,557

City of Holbrook  
 Keams Canyon / I-40 Interchange Utility Feasibility Study  
 Water Option #2  
 Revised September 5, 1999

Description	Qty	Unit	Budget Unit \$ 1999	Total
8-inch PVC C900	22,000	LF	5.76	\$126,720
Pipe Jacking and Casing Under Freeway	300	LF	200.00	\$60,000
Booster Pumping Station				
Duplex 25 HP Pumps with Controls	1	LS	23,890.00	\$23,890
Concrete Pad	1	LS	600.00	\$600
Misc. Piping and Valves	1	LS	1,000.00	\$1,000
Simple 8' x 8' Wood Enclosure	1	LS	2,000.00	\$2,000
Electrical	1	LS	1,000.00	\$1,000
Misc. Valves and Fittings	1	LS	1,000.00	\$1,000
500 Gallon Bladder Tank (Direct Buried)	2	LS	2,000.00	\$4,000
Air Relief Station	2	LS	3,800.00	\$7,600
Fire Hydrant	3	LS	1,500.00	\$4,500
Subtotal				\$232,310
15-Percent Contingency				\$34,847
Grand Total				\$267,157

City of Holbrook  
 Keams Canyon / I-40 Interchange Utility Feasibility Study  
 Water Option #3  
 Revised September 5, 1999

Description	Qty	Unit	Budget Unit \$ 1999	Total
8-inch PVC C900	22,000	LF	5.76	\$126,720
Pipe Jacking and Casing Under Freeway	300	LF	200.00	\$60,000
Booster Pumping Station				
Duplex 25 HP Pumps with Controls	1	LS	23,890.00	\$23,890
Concrete Pad	1	LS	600.00	\$600
Misc. Piping and Valves	1	LS	1,000.00	\$1,000
Simple 8' x 8' Wood Enclosure	1	LS	2,000.00	\$2,000
Electrical	1	LS	1,000.00	\$1,000
Misc. Valves and Fittings	1	LS	1,000.00	\$1,000
Fire Flow System				
75 hp Fire Pump (TEFC Motor)	1	LS	19,900.00	\$19,900
Install two 25,000 Existing Wtr Tanks	1	LS	1,200.00	\$1,200
Concrete Tank Pads	1	LS	600.00	\$600
Misc. Piping	1	LS	1,000.00	\$1,000
Simple Wood Enclosure	1	LS	1,000.00	\$1,000
Electrical and Controls	1	LS	2,000.00	\$2,000
Concrete Pump Pad	1	LS	600.00	\$600
Air Relief Station	2	LS	3,800.00	\$7,600
Fire Hydrant	3	LS	1,500.00	\$4,500
Subtotal				\$254,610
15-Percent Contingency				\$38,192
Grand Total				\$292,802



City of Holbrook  
 Keams Canyon / I-40 Interchange Utility Feasibility Study  
 Water Option #4  
 Revised September 5, 1999

Description	Qty	Unit	Budget Unit \$ 1999	Total
8-inch PVC C900	22,000	LF	5.76	\$126,720
Pipe Jacking and Casing Under Freeway	300	LF	200.00	\$60,000
Booster Pumping Station				
Duplex 25 HP Pumps with Controls	1	LS	23,890.00	\$23,890
Concrete Pad	1	LS	600.00	\$600
Misc. Piping and Valves	1	LS	1,000.00	\$1,000
Simple 8' x 8' Wood Enclosure	1	LS	2,000.00	\$2,000
Electrical	1	LS	1,000.00	\$1,000
Misc. Valves and Fittings	1	LS	1,000.00	\$1,000
Fire Flow System				
75 hp Fire Pump (TEFC Motor)	1	LS	19,900.00	\$19,900
Install two 25,000 Existing Wtr Tanks	1	LS	1,200.00	\$1,200
Concrete Tank Pads	1	LS	600.00	\$600
Misc. Piping	1	LS	1,000.00	\$1,000
Simple Wood Enclosure	1	LS	1,000.00	\$1,000
Electrical and Controls	1	LS	2,000.00	\$2,000
Concrete Pump Pad	1	LS	600.00	\$600
500 Gallon Bladder Tank (Direct Buried)	2	LS	2,000.00	\$4,000
Air Relief Station	2	LS	3,800.00	\$7,600
Fire Hydrant	3	LS	1,500.00	\$4,500
Subtotal				\$258,610
15-Percent Contingency				\$38,792
Grand Total				\$297,402

City of Holbrook  
Keams Canyon / I-40 Interchange Utility Feasibility Study  
Wastewater Option #1  
Revised September 5, 1999

Description	Qty	Unit	Budget Unit \$ 1999	Total
6-inch PVC SDR35	25,500	LF	1.42	\$36,210
Manhole	64	EA.	1,000.00	\$64,000
Subtotal				\$100,210
15-Percent Contingency				\$15,032
Grand Total				\$115,242

Note: Only services the north side of the freeway.

City of Holbrook  
Keams Canyon / I-40 Interchange Utility Feasibility Study  
Wastewater Option #2  
Revised September 5, 1999

Description	Qty	Unit	Budget Unit \$ 1999	Total
8-inch PVC SDR35	25,500	LF	2.45	\$62,475
Manhole	64	EA.	1,000.00	\$64,000
Subtotal				\$126,475
15-Percent Contingency				\$18,971
Grand Total				\$145,446

Note: Only services the north side of the freeway.



City of Holbrook  
Keams Canyon / I-40 Interchange Utility Feasibility Study  
Wastewater Option #3  
Revised September 5, 1999

Description	Qty	Unit	Budget Unit \$ 1999	Total
10-inch PVC SDR35	25,500	LF	3.95	\$100,725
Manhole	64	EA.	1,000.00	\$64,000
Subtotal				\$164,725
15-Percent Contingency				\$24,709
Grand Total				\$189,434

Note: Only services the north side of the freeway.

City of Holbrook  
 Keams Canyon / I-40 Interchange Utility Feasibility Study  
 Wastewater Option #4  
 Revised September 5, 1999

Description	Qty	Unit	Budget Unit \$ 1999	Total
8-inch PVC SDR35 (gravity sewer)	1,500	LF	2.49	\$3,735
Pipe Jacking and Casing Under Freeway	300	LF	200.00	\$60,000
Manhole	4	EA.	1,000.00	\$4,000
150,000 GPD Denitrifying Package Water Reclamation Plant	1	EA.	310,000.00	\$310,000
Unlined Reuse Storage Pond	1	EA.	150,000.00	\$150,000
8-inch PVC SDR21 (reuse distribution piping)	1,500	LF	4.48	\$6,720
Electrical	1	LS	10,000.00	\$10,000
Subtotal				\$544,455
15-Percent Contingency				\$81,668
Grand Total				\$626,123

Note: Services both sides of the freeway.

City of Holbrook  
 Keams Canyon / I-40 Interchange Utility Feasibility Study  
 Wastewater Option #5  
 Revised September 5, 1999

Description	Qty	Unit	Budget Unit \$ 1999	Total
New Wet Well Concrete for Two New Pumping Stations	14.4	CY	250.00	\$3,600
Supporting Members and Grating for New Pumping Station	2	LS	2,464.00	\$4,928
One New Additional Pump per Pumping Station	2	EA.	6,500.00	\$13,000
Misc. Piping and Valves for New Pumping Station	2	LS	1,000.00	\$2,000
Simple Wood Enclosure for New Pumping Station	2	LS	1,000.00	\$2,000
Concrete Pad for Wood Enclosure	2	LS	600.00	\$1,200
Miscellaneous Electrical	2	LS	1,000.00	\$2,000
Subtotal				\$28,728
15-Percent Contingency				\$4,309
Grand Total				\$33,037

Note: Only services the north side of the freeway.



City of Holbrook  
 Keams Canyon / I-40 Interchange Utility Feasibility Study  
 Wastewater Option #6  
 Revised September 5, 1999

Description	Qty	Unit	Budget Unit \$ 1999	Total
New Wet Well Concrete for Two New Pumping Stations	14.4	CY	250.00	\$3,600
Supporting Members and Grating for New Pumping Station	2	LS	2,464.00	\$4,928
One New Additional Pump per Pumping Station	2	EA.	6,500.00	\$13,000
Misc. Piping and Valves for New Pumping Station	2	LS	1,000.00	\$2,000
Simple Wood Enclosure for New Pumping Station	2	LS	1,000.00	\$2,000
Concrete Pad for Wood Enclosure	2	LS	600.00	\$1,200
Miscellaneous Electrical	2	LS	1,000.00	\$2,000
IPF Lift Station	1	LS	12,000.00	\$12,000
4-inch PVC SDR21 Forcemain Pipeline	1,000	LF	1.32	\$1,320
Pipe Jacking and Casing Under Freeway	300	LF	200.00	\$60,000
Subtotal				\$102,048
15-Percent Contingency				\$15,307
Grand Total				\$117,355

Note: Services both sides of the freeway.

8